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ORIGINAL ARTICLES.

THE NON-OPERATIVE TREATMENT OF CHRONIC EMPYEMA.[1]

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JUST two years ago I read a paper before the College in which I tried briefly to indicate some of the advantages which civil surgeons might derive from four years' experience in military surgery, and tonight I shall endeavor to show that in one field at least the predictions made then have been realized.

Chronic empyema represents one of those conditions which has taxed surgical ingenuity to the utmost, and which has demanded for its cure operations which, in their turn, are accompanied by a high mortality and if successful still leave the patient crippled and handicapped for the more arduous occupations and recreations of life. I refer to the extensive rib resections which bear the names of Estlander and Schede, the decortication of the lung, of Fowler, and any of the other methods employed for carrying the chest-wall into the lung or bringing the lung out to it. Of course other less severe methods, such as the injection of Beck's paste, have caused some of the smaller cavities to heal, but success has been limited and failure has been followed by the more formidable plastic operations.

It is a wise man who profits by his misfortune and the same may be said of a race or generation. Within the past few years the world has passed through its greatest misfortune within the memory of

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man, the World War. Surgery has always profited by war—in experience, in new devices, in discoveries and in new methods of treatment—and the great world struggle of five years registers no exception, for the treatment of wounds has been revolutionized and the treatment of infections enormously advanced.

Before this war a surgeon who dared to close without drainage a penetrating wound of the chest would have been liable to suit in case of death, and yet today a failure to close such a wound completely would be looked upon as a surgical mistake. The attempt to sterilize a suppurating pleural cavity is no new idea (Beck's paste and Murphy's formalin injections), but it was the war which brought about its practicability and realization.

Chronic empyema, except the tuberculous type, results from an uncured acute infection of the pleura or from the presence of a foreign body in the pleural cavity. The foreign bodies which prevent healing are not confined to the missiles of warfare, as those of you know who have removed drainage tubes which had been "lost." We have all dreaded these old suppurating pleural cavities and our patients have often passed from the hands of one surgeon to another, hoping their next operation would be their last; only too often it is.

The horrible shell-wounds of the thorax gave the military surgeon a wonderful opportunity for study, and the advance that was made in this field of surgery was one of the greatest that has ever been made. At the close of the war fairly definite rules could be laid down for the treatment of these cases. There was a large group which required no operation whatever, those operated upon were closed completely and the cases which later suppurated were subjected to some method of sterilization. These rules need not be rehearsed here, nor need anything be said of Dakin's solution or the Carrel method of employing it. The journals, recent monographs and text-books have made them known to all.

The application of the Carrel-Dakin treatment in acute empyema has also been extensively discussed in the recent surgical literature, and I am of those who believe that every case of acute empyema if it survives the immediate result of infection can be sterilized and cured by the painstaking employment of this method of treatment, and I share the hope of others that it will become more generally used, for I believe that its intelligent use will reduce enormously the cases of chronic empyema.

Since January, 1919, when I returned to the practice of civil surgery, I have operated upon eighteen cases of acute empyema and in all I have started the Carrel-Dakin treatment usually within forty-eight hours after the drainage of the cavity. Except one case that died and two recent cases still in the hospital, sterilization and healing have taken place in all but one, who is tuberculous and still has a little drainage, although he is working and earning his living. I admit that such experiences might be readily duplicated by simple drainage, especially in children. My youngest patient was eighteen years of age and the others ranged between twenty-one and fifty. I am convinced by my previous experiences that some of these patients who had large collections of pus of weeks' duration would have remained unhealed today under the old method of treatment.

In view of the fact that the chronic case follows the acute one, I think that it may not be amiss to refer to recent changes in the treatment of the acute case which I believe tend to the prevention of the chronic condition. In the first place, I no longer try to make a low opening into the cavity because a low opening makes it difficult later to keep the cavity filled with the solution except with the patient in the recumbent position and sometimes only with the chest lower than the pelvis. I think that the opening in the chest-wall should be made at a point over the collection of pus, which will enable one after the operation to keep the cavity filled with Dakin's solution even when the patient is sitting up or on his feet. In recent cases I have not made a rib resection but simply an intercostal incision, and I have given up attempts to remove from the cavity large masses of lymph and the liberation of the lung by digital separation of the adhesions. If the lung will expand in old chronic cases, where it has been bound down for months and years, when the cavity is sterilized and closed, it has seemed to me that it would do so all the more readily in the acute case, and I am sure that it does do so. These changes, then, render the operation in the acute case much simpler and I believe tend greatly to reduce the mortality.

To Depage, of Brussels, belongs the credit of demonstrating that an empyema of long standing of any size may be rendered sterile with Dakin's solution and then closed or allowed to close. I look back to February, 1918, with the greatest satisfaction, when, at a surgical meeting in Paris, Tuffier exhibited some twenty-five cases of empyema, nearly all of gunshot origin, which he had cured by this method, and I consider it one of the most valuable contributions to chest surgery. He generously gave Depage all the credit. One of his cases seemed quite remarkable and the recollection of it has saved me discouragement and caused me to persevere in a number of very troublesome cases which I have since encountered.

Tuffier's case was that of a soldier whose cavity, after a shell injury and infection, occupied nearly the whole of the right chest and was of many months' duration. It was sterilized and closed, only to fill up and reopen in a month or two, when however a Roentgen-ray plate showed the cavity to be one-half its original size. It was again rendered sterile by the Carrel-Dakin method and again closed, but once more it refilled and reopened. The Roentgen-ray plate on this occasion showed the cavity to be one-fourth its original size. For the third time it was sterilized and closed and had remained closed, the last plate showing complete expansion of the lung. My feeling on seeing and examining this case was that any chronic empyema could be successfully treated in this manner, and my experience since, in spite of one or two very discouraging cases, has confirmed this belief. Even some of my acute cases have been very obstinate, but I believe that I have learned the usual causes of delay or failure and that they have their origin in faulty technic. The slides which I show demonstrate what can be done in chronic empyema and that success depends entirely on how closely one adheres to the principles of the Carrel technic.

One of the most common objections to this method has been that it is troublesome and requires more attention than the average patient is apt to get in the hospital ward or his home. That such an objection is absolutely groundless is shown by the fact that two of the cured cases—the slides of which I show—carried out their own sterilization at home, obtaining fresh Dakin's solution at the hospital every two or three days. An intelligent and persistent patient can accomplish far more than an indifferent interne or overworked nurses. It requires enthusaism and persistence and without these failure is sure to result.

The most important points in the treatment are to bear constantly in mind that, in order to accomplish the sterilization, the Dakin's solution must remain in constant contact with the *entire* wall of the abscess cavity, that the solution must be properly made and fresh, and that the greatest care must be exercised to prevent reinfection of the sinus and cavity from the skin. To the neglect of one of these three things I attribute all of my own failures or delays. The delayed sterilization and closure in the acute cases, also, has been due to neglect in one of these three particulars. The low opening and the bed-rest have been potent factors in preventing the contact between the solution and all parts of the abscess cavity. One patient, an acute case, was many weeks in closing, due entirely to the fact that I had made the opening over the lower part of her cavity and that after operation she was not kept in the recumbent position but was allowed to sit up in bed and used the bed-rest for a greater part of the time. She healed promptly when she was made to occupy constantly a position which enabled us to keep the cavity filled with the solution. Again I have experienced delay in sterilization owing to the use of Dakin's solution which was too old. Reinfection of the cavity from failure to keep the surrounding skin sterile can be easily demonstrated by taking smears from the cavity, the sinus and the surrounding skin.

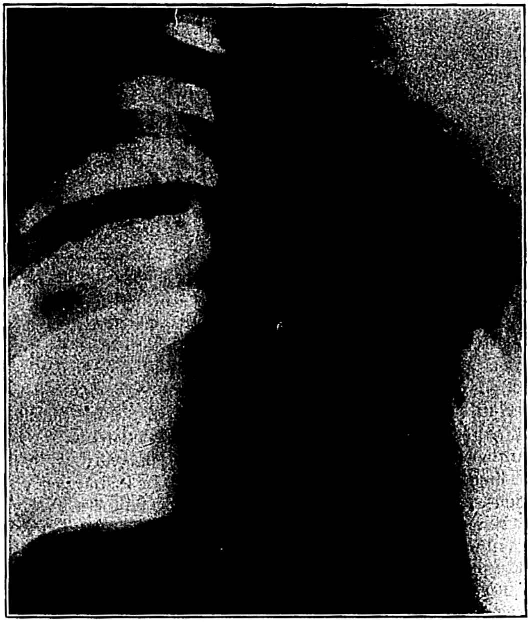
If cases such as shown by Tuffier, three years ago, and such as I show now can be cured, we should be able to cure practically all cases. A study of our failures will do more to improve our results than a complaisant contemplation of our successes. I have failed in certain cases where the infection was due to the tubercle bacillus, and in others where a persistent sinus had followed the Estlander or Schede operation. I have one case still under treatment after fifteen months. This man came under my care in November, 1919, about a year after his operation for empyema. He was running a continuous fever and had a cavity that would hold six or eight ounces. It was sterilized and closed in four weeks, but opened up again in another three or four weeks. Since then the sinus has opened and closed several times and it is open now, but the patient has gained weight and has been at work for six or eight months.

The plan of treatment in the chronic case has been as follows: The capacity of the cavity is estimated by filling it with the patient in such a position that the mouth of the sinus is higher than all parts of the cavity; its exact position and shape have been determined by injecting bismuth in oil and taking stereoscopic Roentgen-ray plates. When this has been done we know the position which the patient should occupy during the treatment in order to keep the Dakin's solution in contact with every part of the cavity. This I consider one of the most important points in the treatment.

The question of operation is now considered. In the absence of necrosis of the rib or the presence of a foreign body no operation has been found necessary in our cases, unless a dilatation of the old sinus may be considered an operation. It is only necessary to make the sinus large enough to accommodate two or three Carrel tubes. Several of our cases have been cured with a single tube in the sinus and I have never had any trouble from contracture of the sinus. In the beginning of the treatment, if more than one tube is used, one of them is left open at the end or a catheter is used in order to permit a thorough washing out of the cavity once a day. The cavity is then kept filled with the solution, just enough being added every two hours during the day and every three hours during the night to keep it full. The tightness of the sinus around the tubes and the correct position of the patient should prevent the escape of the fluid. Unless care is given to the regular instillation of the fluid there is no use in trying this treatment, as failure will certainly be the result.

With the apparent disappearance of pus, smears are taken from the depth of the cavity and from the sinus. When these smears are negative for three or four consecutive days the tube is withdrawn regardless of the size of the cavity, and the sinus and the skin about it kept sterile with iodine until closure takes place. I do not think it is necessary to close the wound and I am almost sure that it is better not to do so. The operation may cause the liberation of dormant organisms in the tissues about the mouth of the sinus which in turn may cause a reinfection. Such infections were constantly seen in plastic operations done months after the complete healing of gunshot wounds. If the cavity and sinus are not sterile when the tube is removed, pus will soon be found again in the discharge and the tube can readily be reintroduced. If a closure has been made and the cavity is not sterile one only discovers it by physical signs and fever, and before these develop the old cavity has become distended with pus. If a reaccumulation of pus occurs after closure or after healing of the sinus, as certainly will occur in some cases, the tubes must be reinserted and the sterilization repeated. I have had this experience several times in the acute cases.

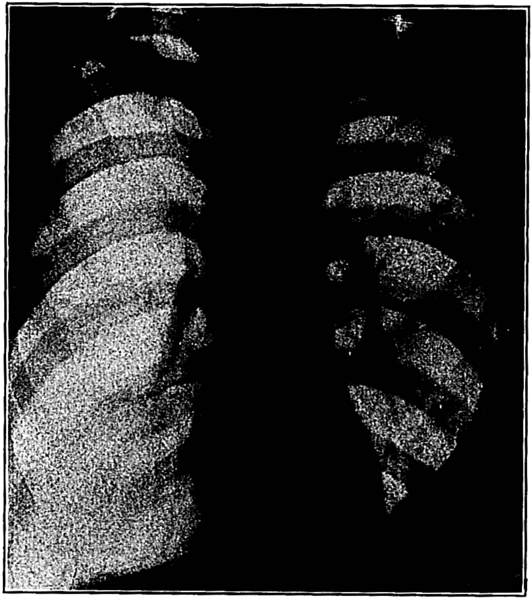
It has been suggested that Dakin's solution causes bleeding and I have seen it in a few chronic cases. I do not think that it is apt to occur until the cavity is sterile, and if no organisms are present in the smears from the cavity and sinus the tube should be withdrawn and the sinus treated with iodine until closed. If bleeding occurs and organisms are still present, normal salt solution should be used for a time and then the Dakin's solution resumed.



Case I.—March 7, 1919. (See page 476.)

Bronchial fistula is a very troublesome complication and renders the treatment difficult. I have had but two such cases and in both the opening into the bronchus closed with simple drainage of the cavity or under salt solution irrigation. The first chronic case we treated (Case I) had a bronchial fistula and it healed while the Dakin's solution was being used. I think that unless the fistula is large and the cavity a very old one it will usually heal if the cavity is kept empty. It may be necessary in these to make a low opening in order to get drainage, but I have not had to do it. We often see these fistulæ heal after the drainage of a lung abscess.

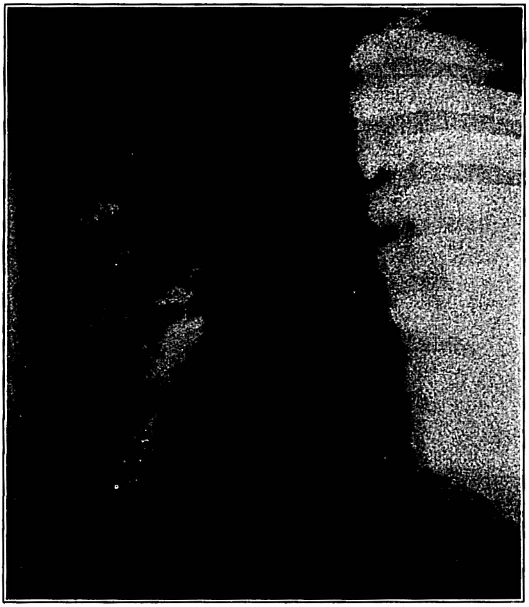
The following five cases (I have not included cases operated upon or treated by my assistants) illustrate the points I have tried to make and constitute my experience in the chronic condition—with the exception of three other cases, in one of which there is a tuberculosis of the lung, in another a large cavity was lined with a thick shell of bone, and in the third an extensive plastic operation had been done and a long narrow sinus remained. The tuberculous case is still under treatment with a regularly diminishing cavity, the calcareous case died two months after an extensive plastic operation, and the third case has disappeared.



Case I.—April 26, 1920. Wound closed since September, 1919. (See page 476.)

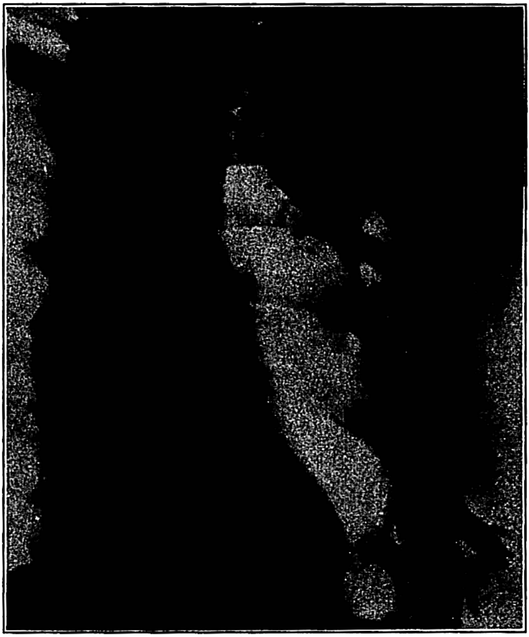
This experience is not large, but owing to the better treatment of acute empyema one does not see so many of the chronic cases. I feel, however, that it is large enough to show that we have in this treatment—which originated in the war—the best method of dealing with the chronic empyema of civil life, and that it should be conscientiously tried before resort is had to the formidable and mutilating plastic operations.

Before undertaking the treatment I think that one should familiarize himself with the details of the Carrel technic. In the beginning failure is sure to be met; the one failure and the repeated delays in my own experience have been due I am sure to my own faults in technic already referred to.



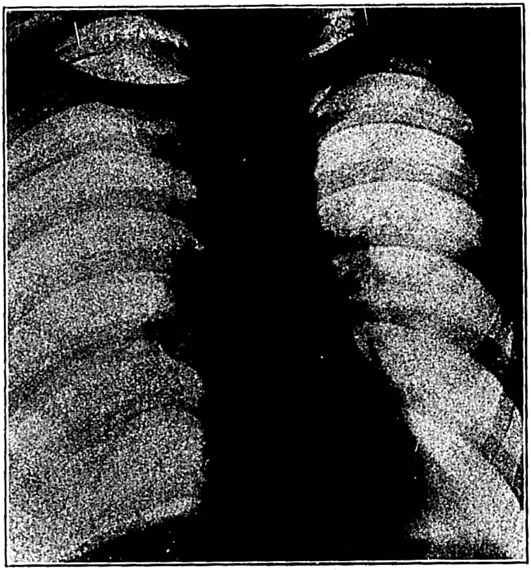
Case II.—April 15, 1919. Patient on right side. (See page 478.)

Case I.—C. B. W., aged thirty-eight years. Pennsylvania Hospital. This patient came under my care March 29, 1919. In May, 1918, he had a pneumonia followed by an empyema, which "pointed" in the interspace just below the left nipple and was simply incised by his physician. Since this time he has had more or less continuous drainage and fever. As soon as the sinus closed the patient expectorated pus, but this stopped when the sinus opened again. The pus from the cavity shows streptococci, staphylococci and pneumococci. The sinus was injected with bismuth and oil and excellent stereoscopic plates were made by Dr. Manges. The outline of the cavity is irregular and extended posteriorly up under the scapula and as far down as the tenth rib. The communication with the bronchus is also shown in the plates. After this examination the patient coughed up at once a considerable amount of bismuth and oil. The empyema was evidently of the interlobar type. Under gas anesthesia a portion of the sixth rib and its cartilage, both of which were diseased, was removed and the sinus dilated until it admitted a finger easily. Considerable bismuth and oil were evacuated and two tubes were introduced. The Carrel-



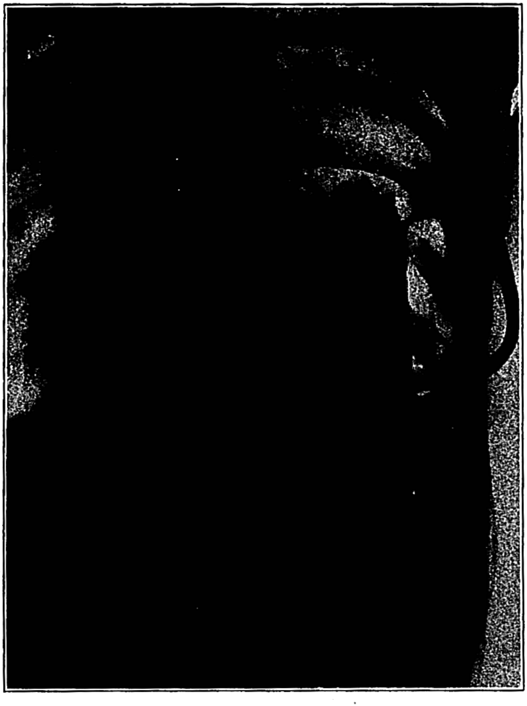
CASE II.—April 15, 1919. Patient on back. (See page 478.)

Dakin treatment was begun three or four days after the operation and the patient was discharged from the hospital on May 5th. At this time there were still organisms in the smears but the patient was much improved. From this time until his complete cure the treatment was carried out at his home by his wife, the Dakin's solution being obtained fresh from the hospital every two or three days and the patient reporting once a week. The sinus closed in August but reopened in September; it closed again after a week or two weeks and has remained closed ever since. The patient gained about forty pounds in weight during the course of his treatment and carried on his work, that of manager of a large farm. Recent examination shows perfect function with complete expansion of the lung and these findings are confirmed by a Roentgen-ray plate.



Case II.—April 20, 1920. Wound closed since September, 1919.

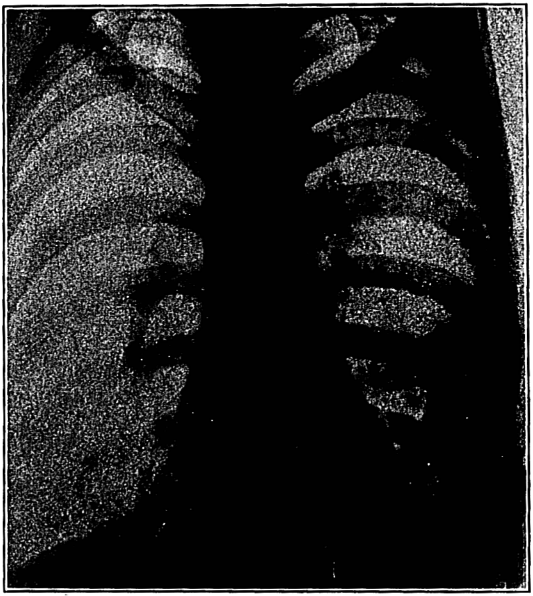
Case II.—W. R. L., aged thirty-five years. Pennsylvania Hospital. This patient came under my care April 7, 1919. He had an empyema which had been drained with rib resection in September, 1918, in another hospital. The empyema had developed insidiously the previous May. Drainage has kept up ever since operation and the patient has fever off and on. Injection of the cavity and Roentgen-ray plates showed it to be very large and to extend posteriorly as high as the second rib. It was evidently of the interlobar type. He was admitted to the hospital, April 14, 1919, the sinus was dilated without an anesthetic, bismuth, oil and pus evacuated, and the Carrel-Dakin treatment started. After about three weeks he went home, where a sister, who was a trained nurse, carried out the treatment. The sinus in this case was four and one-half inches long and the length of the cavity three inches. A catheter was employed for the instillation of the fluid. The sinus closed in September and has remained closed since and there is good expansion of



CASE III.—November 3, 1919. (See page 480.)

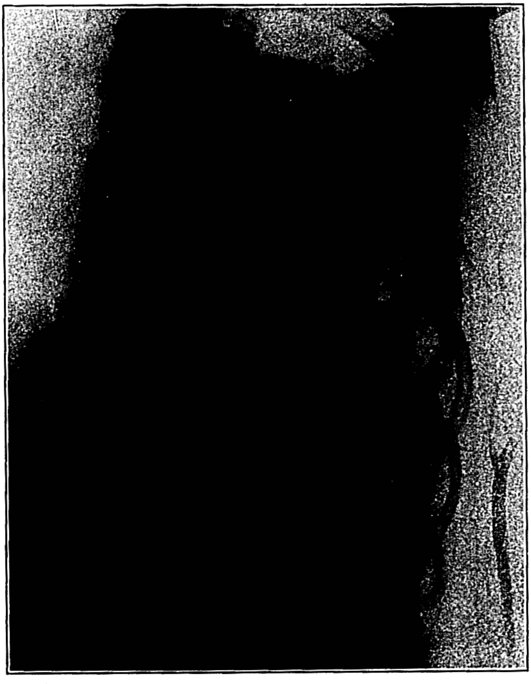
the lung. Patient gained about ten pounds in weight and went back to work in July. In this case the opening of the sinus was far below the cavity, but the patient was made to keep the recumbent position after each instillation of the fluid and the tightness of the sinus about the catheter tended to prevent the escape of the solution. His chest appears normal on physical and Roentgen-ray examination.

Case III.—W. W., aged forty-four years. Pennsylvania Hospital. This man was operated upon for empyema on December 4, 1918, by Dr. Stewart. An intercostal incision was made and a double tube inserted. Dakin's solution was employed for a short time. He was discharged March 16, 1919, still draining. He was readmitted on May 16th, when another incision was made to give better drainage. He was discharged on the 25th much improved. He was admitted to my service November 12th, about a year after his first operation. He had fever and a discharging sinus. The plates showed quite a large cavity containing six or eight ounces of



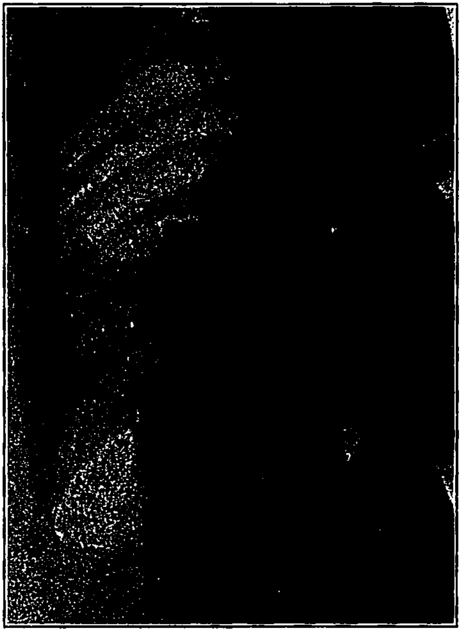
Case III.—March 25, 1921.

fluid. Carrel-Dakin treatment was commenced, and as smears were negative on three occasions the sinus was closed on December 24th, about six weeks after the commencement of the treatment. It remained closed for about a month when he was readmitted with fever and the physical signs of fluid. His condition immediately improved and the cavity began to grow rapidly less under the Carrel-Dakin treatment. Since this time closure has taken place twice, but each time has been followed by a reaccumulation of pus. For the last six or eight months the man has been at work. This case represents a failure thus far, but I believe if the patient were kept on his back the cavity could be readily sterilized. The patient is loath to give up his work and his general health has improved so much that I have not insisted upon the necessary rest.



CASE IV.—September 14, 1920. Patient erect. (See page 482.)

Case IV.—P. P., aged thirty-four years. Pennsylvania Hospital. This man was operated upon in another hospital March 6, 1920, for an empyema following pneumonia. A rib section and drainage was done. The sinus has remained open ever since. He came into my service on September 13, 1920, six months after his operation. Roentgen-ray plates showed a large cavity. Carrel-Dakin treatment was started and fairly prompt sterilization was accomplished, the patient being discharged with the sinus closed on October 25. It has never reopened and the patient has been perfectly well and now has full expansion of the lung, but his Roentgen-ray plate shows considerable bismuth in the lower part of the cavity. I regret that we did not get rid of all the bismuth in this case. However, he demonstrates a quick and complete cure in a chronic condition.

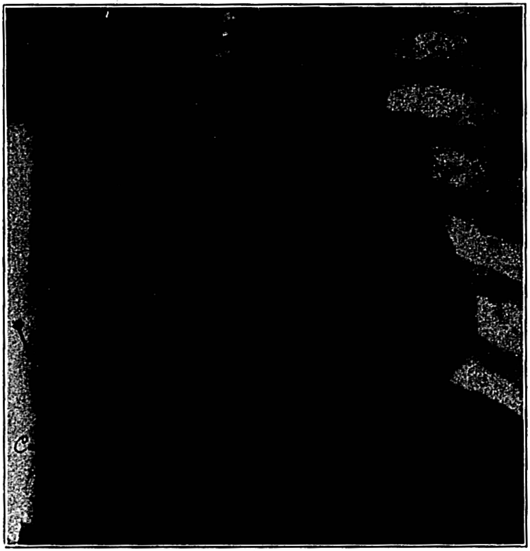


Case IV.—September 14, 1920. Patient on side.

CASE V.—E. S., aged eighteen years. Jefferson Hospital. This boy was operated upon for empyema in a neighboring town in 1912. Several ribs were resected. He was in the hospital seven months and was discharged cured, the wound being entirely healed. He had no trouble for seven years (August, 1920), when a small fragment of bone was discharged. At this time he was admitted to the Pennsylvania Hospital and operated upon by Dr. Mitchell for a necrosis of the third, fourth, fifth and sixth ribs. The sinus was curetted and injected with Lassar's paste. Later a counter-opening was made lower down. He was discharged from the hospital on October 9, the sinus being entirely healed. In January, 1921, the upper sinus reopened. He was admitted at this time to the Jefferson Hospital, where a Roentgen-ray examination showed a body of bismuth about the middle of the chest and a smaller portion quite low down near the diaphragm. This bismuth had evidently remained in the chest since last August. When the sinus was injected with bismuth and oil, it was found to communicate with the old bismuth shadow below and there was apparently no communication with that above. The lower cavity was quite large, holding several ounces and communicated with the opening in the chest-wall by a very narrow sinus. There was a fusion of several ribs at the site of the former operations. On February 1, I increased the

CASE IV.—January 7, 1921. Wound closed since October, 1920. (See page 482.)

size of the opening, removing some bone with forceps, dilated the tract and evacuated considerable bismuth and oil. Long curved forceps passed down through the sinus could be felt quite readily between the ribs six inches below. A Carrel tube and catheter were inserted into the cavity and the Carrel-Dakin treatment started the second day after operation. There was considerable discharge of pus for the first ten days, but has nearly altogether disappeared. The patient is still in the hospital. (Patient developed scarlet fever during his convalescence and treatment was interrupted. Later it was recommenced and on discharge April 29, 1921, wound was closed.)



CASE V.—January 19, 1921. Wound closed April, 29, 1921.

To summarize these cases, the first two represent cures after a number of months of home treatment, in one of which there was a bronchial fistula; the third case represents a failure so far, although closure has taken place twice; the fourth case represents a prompt sterilization with permanent closure, and the fifth case a cure.